NOAA Ship *Okeanos Explorer* "Always Exploring" Podcast: Transcript

I'm Mike Ford from the National Marine Fisheries Service at NOAA and I'm here to talk about an oceanographic cruise underway with our colleagues from NOAA Ocean Exploration and Research and the Scripps Institution of Oceanography at UC San Diego.

This transit aboard the *Okeanos Explorer* from Hawaii to San Francisco allows us to explore the plankton communities across an infrequently sampled portion of the Pacific, and sample the contents of the Pacific Garbage Patch as the ship sails across it.

While a mapping team onboard the *Okeanos* scans the seabed with high-resolution mapping gear, a team from the National Marine Fisheries Service and Scripps is sampling the surface water for plankton and plastic – simultaneously fulfilling a mission to explore and advance our understanding of this open ocean ecosystem.

We're interested in plankton across this portion of the Pacific because it's what fish eat. These tiny and mostly microscopic organisms sit at the base of the food chain and are the most abundant form of life in the ocean. The diversity of species and patterns of distribution in the open ocean can provide information that helps us better understand what is happening closer to the coast. Plankton can also provide excellent information on how the whole ecosystem responds to physical changes like El Nino, and climate change. Watching plankton provides better scientific information from which to manage our valuable marine resources.

We're wondering about what kinds of changes we might see as we leave one coast, head out to the open ocean, and approach another coast. We're curious if we will find any new species. And we are interested in how our plankton samples relate to the oceanography of the region.

Plankton

The sampling for plankton actually started in September with a trip from Guam to Hawaii, logging over 3100 nautical miles. Lora Clarke is seen here working on the continuous plankton recorder on the deck of the *Okeanos Explorer* during that trip. The two trips together make up a transect of over 5100 nautical miles of continuous plankton recording, one of the longest such samples of its kind.

The Continuous Plankton Recorder is a is a small towed vehicle that is pulled 70 meters behind the ship and just 10 m below the waves. It stays there for almost two days. As seawater enters the nose of the vehicle it's forced past a slowly advancing strip of silk mesh which captures plankton.

This is Stephanie Oakes looking at the plankton on a section of silk just pulled from a full cassette.

When pulled out of the cassette, the silk looks like this with some plankton captured on it. All this work at sea and all that silk – the length of more than a dozen school buses by the time this trip is over - is only half the work – it will all be brought to the laboratory and the plankton will be carefully identified and counted. It can be difficult to see the plankton on these silks, but here is an image of what plankton would look if we had it on a dish under a microscope – these tiny crustaceans are around a mm long.

Plastics

Our explorations will allow us to sail through the Pacific Ocean Garbage Patch. This is area in the North Pacific associated with the presence of human plastic debris – something you never would suspect 1000 miles from shore. It is a feature that generally coincides with the North Pacific gyre, a natural, circulating current the moves water and potentially buoyant debris. The debris in the Pacific was detected in the 1970's and many organizations have sampled the area. However, there is still relatively little data on location, density, and area of this feature. Observations have included plastic jugs, bottles, fishing buoys, and a lot of small plastic particles.

This cruise will make a contribution to what is known about the size, composition, and chemistry of the area and the plastic within it. This all provides critical information to help assess the impact it is having on this ecosystem and humans. Any measurements to help define the size of this large and dynamic feature helps determine the impact, and taken over time could allow us to measure possible growth.

As other researchers began finding an abundance of small plastic particles, it became feasible that the plastic could enter the marine food chain – consumed by plankton and small fishes and moving up to larger fishes eaten by humans. This connection between plankton, plastic, fish, and humans is an important area for further study.

Along the trip from Hawaii to San Francisco, the team onboard the *Okeanos* will be towing a manta net, net that skims across the surface of the water filtering an Olympic-sized swimming pool of water each time it is towed.

Here, you can see Miriam Goldstein checking the cod-end for particles. Those white particles are about ½ a centimeter in diameter.

And these are only the particles caught by the net. Numerous objects smaller than that pass through the 333 micron or 1/100th of an inch mesh of the net. Those objects don't get away, though. We sample the surface water and filter on a filter even finer than the mesh of the net to capture those. Together, the manta and the filtering should give us a good look at a large portion of the size spectrum for this debris.

Like the plankton samples, much work gets done in the laboratory after the cruise to identify and count the plastic.

We're taking extra tows with the manta net to give colleagues at the NOAA Lab in Seattle some samples for chemical analysis. There, a team will test the particles and their surfaces for legacy contaminants like PCBs and DDT and contemporary contaminants like BPA and endocrine disrupting compounds. This all contributes to an understanding of impact of this area.

This exploration will provide us with new information about plankton communities in some undersampled areas of the Pacific, and add to our understanding of the Pacific Garbage Patch as the ship sails through.